

REMARKS

Reconsideration and allowance of the present application based on the following remarks are respectfully requested.

Claims 1-43, 45 and 48-85 are pending in this application. Claims 1-36, 45, 50-53, 57-76 and 79-85 are withdrawn from consideration as being directed to non-elected species.

Claim Rejections – 35 U.S.C. § 112

The Examiner rejected claim 49 under 35 U.S.C. § 112, first paragraph.

Applicant has amended claim 49 to recite, *inter-alia*, “wherein the optical element has a rotationally asymmetric surface having a shape that defines only one plane of symmetry or no plane of symmetry.” Support for the amendment may be found throughout the original disclosure. By this amendment, Applicant has clarified the claim language further.

Therefore, Applicant respectfully submits that claim 49 is fully compliant with § 112, first paragraph. Thus, Applicant respectfully requests that the rejection of claim 49 under § 112, first paragraph be withdrawn.

Claim Rejections – 35 U.S.C. § 102

The Examiner rejected claims 77-78 under 35 U.S.C. § 102(b) as being anticipated by Akiyama *et al.* (US Patent No. 6,522,475).

Applicant has amended claim 77 to recite, *inter-alia*, “the reflecting-type variable optical-property element has a rotationally asymmetric surface and is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and emergent rays lie, and wherein the rotationally asymmetric surface has a shape that defines only one plane of symmetry or no plane of symmetry.”

By using a reflecting-type variable optical unit, the optical apparatus of claim 77 is rendered more compact and more simple to operate. The optical properties can be changed by applying a low voltage. Hence, a low electrical consumption is achieved. In addition, light losses are minimized achieving essentially no loss in the amount of light.

Akiyama *et al.* merely discloses an optical system composed of two or three optical units which performs variable magnification by changing the position of each optical unit.

However, optical properties of each unit itself does not change. Therefore, Akiyama fails to disclose or suggest a reflecting-type variable optical-property element, as recited in claim 77.

Therefore, Applicant respectfully submits that claim 77 and claim 78 which is dependent from claim 77 are patentable and respectfully requests that the rejection of claims 77 and 78 under § 102(b) be withdrawn.

The Examiner rejected claims 40, 43, 77-78 under 35 U.S.C. 102(b) as being anticipated by Gelbart (U.S. Patent No. 6,147,789).

Applicant has amended claim 40 to recite, *inter-alia*, “a variable optical-property mirror having a reflecting surface, a length thereof along a first direction being longer than a length thereof along a second direction, wherein the variable optical-property mirror is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and emergent rays lie and that the first direction coincides with a predetermined direction, wherein the reflecting surface has a shape that defines only one plane of symmetry or no plane of symmetry, and wherein the predetermined direction is a direction of a cross line formed where the plane in which the incident rays and the emergent rays lie intersects the reflecting surface.” This amendment to claim 40 obviates the above rejection.

By using a variable optical-property mirror with a reflecting surface, the optical apparatus of claim 40 is rendered more compact and more simple to operate. The optical properties can be changed by applying a low voltage. Hence a low electrical consumption is achieved. In addition, light losses are minimized achieving essentially no loss in the amount of light.

Gelbart merely discloses a configuration of a deformable mirror in which single ribbons 1 are arrayed in a line. In Gelbart’s deformable mirror configuration, when the single ribbon 1 is not deformed, it has a rectangular shape, and when it is deformed, the surface shape is cylindrical. That is, the deformable mirror always has two planes of symmetry extending along the direction of the long side and the direction of the short side, respectively. Whereas, the deformable mirror of claim 40 is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and emergent rays lie.

Consequently, Gelbart fails to disclose or suggest a variable optical-property mirror that is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and the emergent rays lie with the first direction (along the longer side of the surface) coinciding with a predetermined direction. Furthermore, Gelbart does not disclose

or suggest that the reflecting surface has a shape that defines only one plane of symmetry or no plane of symmetry, and that the predetermined direction is a direction of a cross line formed where the plane in which the incident rays and the emergent rays lie intersects the reflecting surface, as recited in claim 40.

With regard to claim 43, claim 43 recites “An optical system, consisting of: a rotationally asymmetric surface; and a variable optical-property mirror constructed with a variable shape mirror.”

By using a variable optical-property mirror with a variable shape, the optical system of claim 43 can be rendered more compact and more simple to operate. In addition, light losses are minimized achieving essentially no loss in the amount of light and the aberrations are favorably corrected.

Gelbart merely discloses the configuration of a deformable mirror in which single ribbons 1 are arrayed in a line. In Gelbart, cylindrical lenses 12 and 13, a stop 8 and a lens 14 are arranged in the vicinity of the deformable mirror. Thus, Gelbart fails to disclose or suggest an optical system consisting of a rotationally asymmetric surface and a variable optical-property mirror.

With regard to claim 77, Applicant has amended claim 77 to recite, *inter-alia*, “the reflecting-type variable optical-property element has a rotationally asymmetric surface and is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and emergent rays lie, and wherein the rotationally asymmetric surface has a shape that defines only one plane of symmetry or no plane of symmetry.” This amendment to claim 77 obviates the above rejection.

As stated above, Gelbart merely discloses a configuration of a deformable mirror in which single ribbons 1 are arrayed in a line. In Gelbart’s deformable mirror configuration, when the single ribbon 1 is not deformed, the mirror has a rectangular shape, when the mirror is deformed, the surface shape of the mirror is cylindrical. That is, it always has two planes of symmetry extending along the direction of the long side and the direction of the short side, respectively.

Thus, Gelbart fails to disclose that the variable optical-property mirror is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and the emergent rays lie, and that the reflecting surface has a shape that defines only one plane of symmetry or no plane of symmetry, as recited in claim 77.

Therefore, Applicant respectfully submits that claims 40, 43 and 77, and claim 78 which depends from claim 77, are patentable and respectfully requests that the rejection of claims 40, 43, 77 and 78 under § 102(b) be withdrawn.

The Examiner rejected claims 40, 43, 77 and 78 under 35 U.S.C. 102(b) as being anticipated by Zehnpfennig et al. (U.S. Patent No. 5,406,412).

Applicant has amended claim 40 to recite, *inter-alia*, “a variable optical-property mirror having a reflecting surface, a length thereof along a first direction being longer than a length thereof along a second direction, wherein the variable optical-property mirror is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and emergent rays lie and that the first direction coincides with a predetermined direction, wherein the reflecting surface has a shape that defines only one plane of symmetry or no plane of symmetry, and wherein the predetermined direction is a direction of a cross line formed where the plane in which the incident rays and the emergent rays lie intersects the reflecting surface.” This amendment to claim 40 obviates the above rejection.

Zehnpfennig merely discloses a telescope optical system provided with a deformed secondary mirror 18b. In Zehnpfennig, the deformed secondary mirror 18b is coaxially arranged with the primary mirror 12b. Light rays traveling from the primary mirror 12b and reflecting at the deformed secondary mirror 18b are sent toward the detector 20. These light rays do not always lie in a plane that is along the direction of the long side of the deformed secondary mirror 18b. Moreover, Zehnpfennig is silent with regard to the surface shape of the deformed secondary mirror 18b. Hence, the number of planes of symmetry is unknown.

Consequently, Zehnpfennig fails to disclose or suggest a variable optical-property mirror is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and the emergent rays lie with the first direction coinciding with a predetermined direction. Furthermore, Zehnpfennig fails to disclose or suggest that the reflecting surface has a shape that defines only one plane of symmetry or no plane of symmetry, and that the predetermined direction is a direction of a cross line formed where the plane in which the incident rays and the emergent rays lie intersects the reflecting surface, as recited in claim 40.

Claim 43 recites “An optical system, consisting of: a rotationally asymmetric surface; and a variable optical-property mirror constructed with a variable shape mirror.” By using a variable optical-property mirror constructed with a variable shape mirror, the optical

apparatus of claim 43 is rendered more compact and more simple to operate by allowing more control of the light rays with minimal optical components. The optical properties can be changed by applying a low voltage. Hence a low electrical consumption. In addition, light losses are minimized, achieving essentially no loss in the amount of light.

As stated above, Zehnpfennig merely discloses a telescope optical system provided with a deformed secondary mirror 18b. In Zehnpfennig, the primary mirror 12b is arranged to face the deformed secondary mirror 18b. Zehnpfennig, however, fails to disclose that the primary mirror 12b has a rotationally asymmetric surface. Consequently, Zehnpfennig does not disclose or suggest an optical system consisting of a rotationally asymmetric surface and a variable optical-property mirror.

Applicant has amended claim 77 to recite, *inter-alia*, “an optical element; and a reflecting-type variable optical-property element, wherein the reflecting-type variable optical-property element has a rotationally asymmetric surface and is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and emergent rays lie, and wherein the rotationally asymmetric surface has a shape that defines only one plane of symmetry or no plane of symmetry.” This amendment to claim 77 obviates the above rejection.

Zehnpfennig merely discloses a telescope optical system provided with a deformed secondary mirror 18b. In Zehnpfennig, the deformed secondary mirror 18b is coaxially arranged with the primary mirror 12b. Light rays traveling from the primary mirror 12b and reflecting at the deformed secondary mirror 18b are sent toward the detector 20. These light rays do not always lie in a plane that is along the direction of the long side of the deformed secondary mirror 18b. Moreover, Zehnpfennig is silent with regard to the surface shape of the deformed secondary mirror 18b. Hence, the number of planes of symmetry is unknown.

Consequently, Zehnpfennig fails to disclose or suggest a variable optical-property mirror is arranged such a that incident rays and emergent rays determine only one plane in which the incident rays and the emergent rays lie. Moreover, Zehnpfennig fails to disclose or suggest that the reflecting surface has a shape that defines only one plane of symmetry or no plane of symmetry, as recited in claim 77.

Therefore, Applicant respectfully submits that claims 40, 43 and 77, and claim 78 which depends from claim 77, are patentable and respectfully requests that the rejection of claims 40, 43, 77 and 78 under § 102(b) be withdrawn.

Claim Rejections – 35 U.S.C. § 103

The Examiner rejected claims 41, 42, 48 and 54 under 35 U.S.C. § 103(a) as being unpatentable over Akiyama et al. (U.S. Patent No. 6,522,475).

Claim 41 recites “An optical device comprising: a variable optical-property element; and an optical element having a plurality of rotationally asymmetric surfaces and disposed in a vicinity of the variable optical-property element.”

By using a variable optical-property element, the optical apparatus of claim 41 is rendered more compact and more simple to operate by allowing more control of the light rays with a reduced number of optical components. The optical properties can be changed by applying a low voltage. Hence, a low electrical consumption. In addition, light losses are minimized, achieving essentially no loss in the amount of light.

Akiyama et al. merely discloses an optical system that is composed of two or three optical units and that performs variable magnification by changing the position of each optical unit. However, each unit in Akiyama’s optical system does not change its optical property. Consequently, Akiyama et al. fails to disclose or suggest “a variable optical-property element” and “an optical element having a plurality of rotationally asymmetric surfaces.”

Claim 54 recites “An optical apparatus comprising: an image sensor and an optical element; a supporting member for holding said image sensor and said optical element; and another optical element disposed in a vicinity of said supporting member.”

By providing a structure in which an image sensor and an optical element are held by a single supporting member, the optical apparatus is rendered more compact. As a result the cost for manufacturing the optical apparatus can be reduced.

Akiyama et al. merely discloses an optical system that is composed of two or three optical units and an image sensor. Akiyama et al. does not disclose or suggest a supporting member for the optical units and the image sensor. Consequently, Akiyama et al. fails to disclose or suggest a structure in which an image sensor and an optical element are held by a supporting member, as recited in claim 54.

Therefore, Applicant respectfully submits that claims 41 and 54, and claims 42, 48 which depend from claim 41, are patentable and respectfully requests that the rejection of claims 41, 42, 48 and 54 under § 103(a) be withdrawn.

The Examiner rejected claims 37-39, 41-42, 48 and 54-56 under 35 U.S.C. § 103(a) as being unpatentable over Gelbart (U.S. Patent No. 6,147,789).

Claim 37 has been amended to recite “A variable optical-property mirror unit comprising: a variable optical-property mirror comprising a rotationally asymmetric reflecting surface, a length thereof along a first direction being different from a length thereof along a second direction; and a driving circuit constructed and arranged to drive the variable optical-property mirror, wherein the variable optical-property mirror is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and the emergent rays lie and that one of the first direction and the second direction coincides with a predetermined direction, wherein the reflecting surface has a shape that defines only one plane of symmetry or no plane of symmetry, and wherein the predetermined direction is a direction of a cross line formed where the plane in which the incident rays and the emergent rays lie intersects the reflecting surface.” The amendment to claim 37 obviates the above rejection.

By using a variable optical-property mirror, the optical apparatus of claim 37 is rendered more compact and more simple to operate by allowing more control of the light rays with a reduced number of optical components. The optical properties can be changed by applying a low voltage. Hence a low electrical consumption is achieved. In addition, light losses are minimized, achieving essentially no loss in the amount of light.

Gelbart merely discloses the configuration of a deformable mirror in which single ribbons 1 are arrayed in a line. In Gelbart's deformable mirror configuration, when the single ribbon 1 is not deformed, it has a rectangular shape, and when the mirror is deformed, the surface shape of the mirror is cylindrical. That is, it always has two planes of symmetry extending along the direction of the long side and the direction of the short side, respectively.

Consequently, Gelbart fails to disclose or suggest that the variable optical-property mirror is arranged in such a manner that incident rays and emergent rays determine only one plane in which the incident rays and the emergent rays lie with the first direction or the second direction coinciding with a predetermined direction, as recited in claim 37. Moreover, Gelbart does not disclose or suggest that the reflecting surface has a shape that defines only one plane of symmetry or no plane of symmetry, and that the predetermined direction is a direction of a cross line formed where the plane in which the incident rays and the emergent rays lie intersects the reflecting surface, as recited in claim 37.

Claim 41 recites “An optical device comprising: a variable optical-property element; and an optical element having a plurality of rotationally asymmetric surfaces and disposed in a vicinity of the variable optical-property element.”

Gelbart merely discloses the configuration of a deformable mirror in which single ribbons 1 are arrayed in a line. In Gelbart, cylindrical lenses 12 and 13 are arranged in the vicinity of the deformable mirror. However, the cylindrical lens 12 has only one rotationally asymmetric surface. In addition, the element 13 only has plane surfaces. Consequently, Gelbart does not disclose or suggest an optical device comprising “a variable optical-property element” and “an optical element having a plurality of rotationally asymmetric surfaces,” as recited in claim 41.

Claim 54 recites “An optical apparatus comprising: an image sensor and an optical element; a supporting member for holding said image sensor and said optical element; and another optical element disposed in a vicinity of said supporting member.”

By providing a structure in which an image sensor and an optical element are held by a single supporting member, the optical apparatus is rendered more compact. As a result the cost for manufacturing the optical apparatus can be reduced.

Gelbart merely discloses a configuration of a deformable mirror in which single ribbons 1 are arrayed in a line. The deformable mirror of Gelbart is held by the silicon substrate 4. However, the silicon substrate 4 does not hold any other element (for instance, the light sensitive material 15). Consequently, Gelbart does not disclose or suggest an optical apparatus in which an image sensor and an optical element are held by a single supporting member.

Therefore, Applicant respectfully submits that claims 37, 41 and 54, and claims 38, 39, 42, 48, 55 and 56 which depend from one of claims 37, 41 and 54, are patentable and respectfully requests that the rejection of claims 37-39, 41-42, 48 and 54-56 under § 103(a) be withdrawn.

The Examiner rejected claims 37-39, 41-42, 48 and 54-56 under 35 U.S.C. § 103(a) as being unpatentable over Zehnpfennig et al. (U.S. Patent No. 5,406,412).

Claim 37 has been amended to recite “A variable optical-property mirror unit comprising: a variable optical-property mirror comprising a rotationally asymmetric reflecting surface, a length thereof along a first direction being different from a length thereof along a second direction; and a driving circuit constructed and arranged to drive the variable

optical-property mirror, wherein the variable optical-property mirror is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and the emergent rays lie and that one of the first direction and the second direction coincides with a predetermined direction, wherein the reflecting surface has a shape that defines only one plane of symmetry or no plane of symmetry, and wherein the predetermined direction is a direction of a cross line formed where the plane in which the incident rays and the emergent rays lie intersects the reflecting surface.” The amendment to claim 37 obviates the above rejection.

Zehnpfennig merely discloses a telescope optical system provided with a deformed secondary mirror 18b. The deformed secondary mirror 18b of Zehnpfennig is coaxially arranged with the primary mirror 12b. Light rays traveling from the primary mirror 12b and reflecting at the deformed secondary mirror 18b are directed onto detector 20. These light rays do not always lie in a plane that is along the direction of a long side of the deformed secondary mirror 18b. Moreover, Zehnpfennig is silent with respect to the surface shape of the deformed secondary mirror 18b. Thus, the number of planes of symmetry of the deformed secondary mirror 18b is unknown.

Consequently, Zehnpfennig fails to disclose or suggest a variable optical-property mirror is arranged such that incident rays and emergent rays determine only one plane in which the incident rays and the emergent rays lie with the first direction or the second direction coinciding with a predetermined direction, as recited in claim 37. Moreover, Zehnpfennig does not disclose or suggest that the reflecting surface has a shape that defines only one plane of symmetry or no plane of symmetry, and that the predetermined direction is a direction of a cross line formed where the plane in which the incident rays and the emergent rays lie intersects the reflecting surface, as recited in claim 37.

Claim 41 recites “An optical device comprising: a variable optical-property element; and an optical element having a plurality of rotationally asymmetric surfaces and disposed in a vicinity of the variable optical-property element.”

Zehnpfennig merely discloses a telescope optical system provided with a deformed secondary mirror 18b. In Zehnpfennig, the primary mirror 12b is arranged to face the deformed secondary mirror 18b. However, the primary mirror 12b has only one reflecting surface and the surface is not rotationally asymmetric.

Consequently, Zehnpfennig fails to disclose or suggest an optical device comprising “a variable optical-property element” and “an optical element having a plurality of rotationally asymmetric surfaces.”

Claim 54 recites “An optical apparatus comprising: an image sensor and an optical element; a supporting member for holding said image sensor and said optical element; and another optical element disposed in a vicinity of said supporting member.”

As stated above, Zehnpfennig merely discloses a telescope optical system provided with a deformed secondary mirror 18b. In Zehnpfennig, the deformed secondary mirror 18b is held by the rigid base plate or beam 36b. However, the rigid base plate or beam 36b does not hold any other element (for instance, the detector 20b).

Consequently, Zehnpfennig fails to disclose or suggest an optical apparatus in which an image sensor and an optical element are held by a single supporting member.

Therefore, Applicant respectfully submits that claims 37, 41 and 54, and claims 38, 39, 42, 48, 55 and 56 which depend from one of claims 37, 41 and 54, are patentable and respectfully requests that the rejection of claims 37-39, 41-42, 48 and 54-56 under § 103(a) be withdrawn.

CONCLUSION

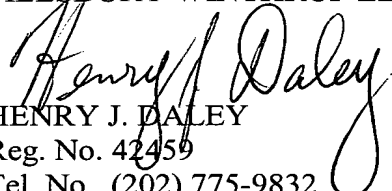
In view of the foregoing, the claims are now in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to contact the undersigned at the telephone number listed below.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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